AN AUSTRALIAN SPECIES OF THE GENUS *BITTACUS* LATREILLE (MECOPTERA : BITTACIDAE)

KEVIN J. LAMBKIN

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Bittacus eremus sp. nov. has been found at Kroombit Tops in central Queensland. This is the first record of the genus from the Australian region. The species is assigned to *Bittacus* Latreille as presently defined, but a reassessment of this large genus, which is now cosmopolitan, may be necessary.

☐ *Bittacidae, Bittacus, Mecoptera, taxonomy, Kroombit Tops, Australia.*

Kevin J. Lambkin, 75 Alexandra Street, Bardon, Queensland 4065, Australia; 1 May 1986.

Bittacus Latreille is the largest and most widespread genus of the Bittacidae. It includes 102 valid described species and has been recorded from all zoogeographical regions, with the notable exception of the Australian region. Details of its distribution are as follows: Africa south of the Sahara (54 species), Europe (2 species), North America (10 species), South America (2 species), eastern and southern Asia (34 species) (Penny and Byers, 1979; Byers, 1979; Mickoleit, 1979; Londt, 1981; Willmann, 1983; Plutenko, 1985). In the present context, it is of interest that it has not been recorded from the Philippines, Malaysia or Indonesia.

In February 1984, Geoff Monteith of the Queensland Museum collected one male and one female specimen of a species of bittacid unlike any previously known from Australia. The specimens were taken at Kroombit Tops, a high (800–900 m) sandstone plateau approximately 65 km SSW of Gladstone, a town on the central Queensland coast. This remarkable species, with maculate wings, does not fit into any of the endemic Australian genera of the family (*Austrobittacus* Riek, *Edriobittacus* Byers, *Harpobittacus* Gerstaecker, *Symbittacus* Byers, *Tytthobittacus* Smithers) but, surprisingly, exhibits a suite of characters completely compatible with its placement in *Bittacus*.

The species is described and illustrated herein, and its assignment to the genus *Bittacus* is briefly discussed. All measurements are in millimetres. The interpretation of the thoracic sclerites follows that of Storch and Chadwick (1968).

Bittacus eremus sp. nov.
(Figs 1–8)

MATERIAL EXAMINED

HOLOTYPE: ♂ (Queensland Museum T.10,202, in alcohol), above (NW) Beauty Spot 98, Kroombit Tops, central Queensland, 24°22'08"S, 150°59'33"E (Queensland Department of Forestry 1:50,000 map 90492 (Kroombit): 962 034), 4.ii.1984, G.B. Monteith, 'at light'.

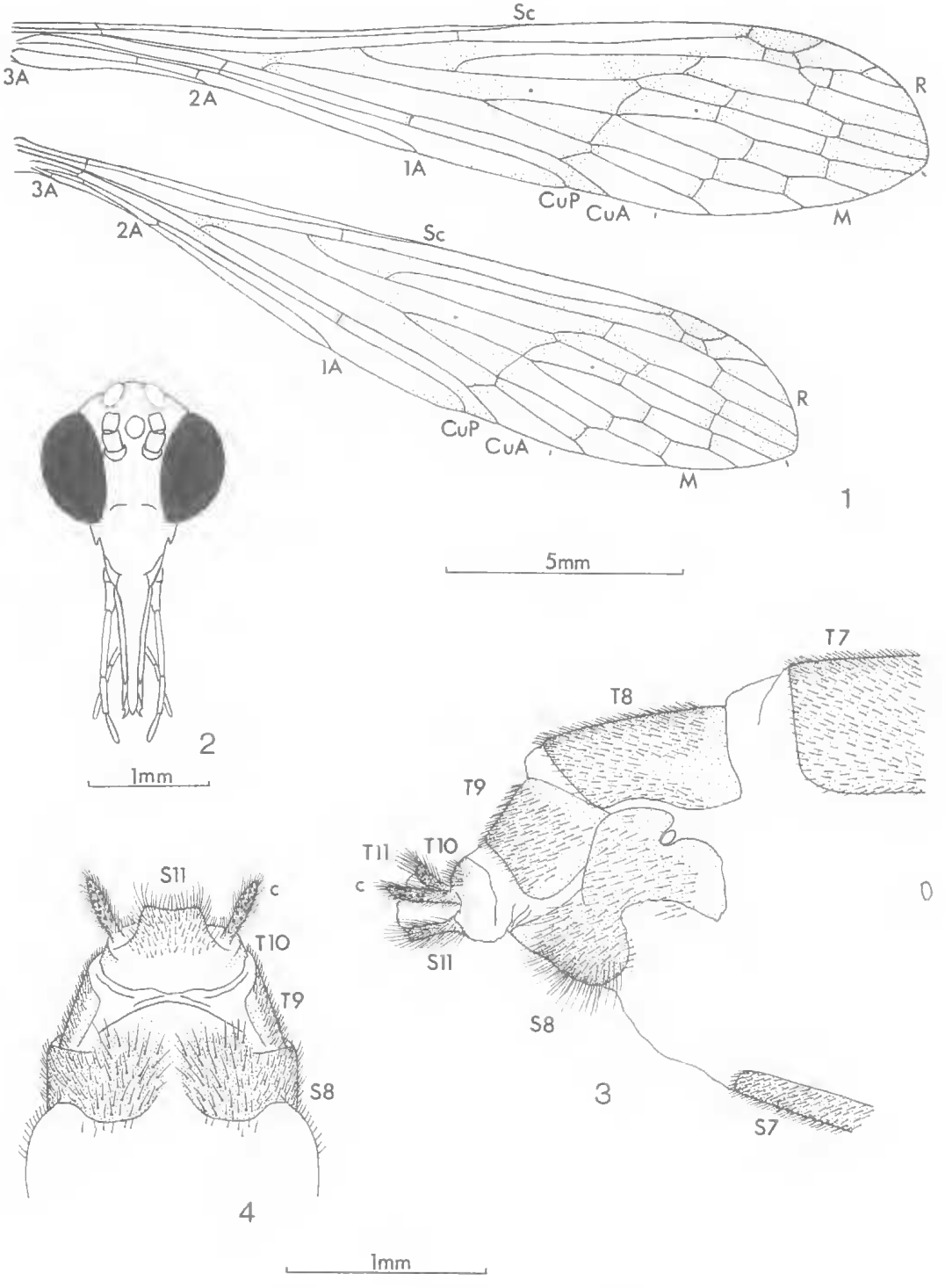
PARATYPE: ♀ (Queensland Museum T.10,203, in alcohol), as for holotype, but 'on grass at night'. No other specimens known.

DESCRIPTION

Body length. 20.2 (holotype ♂), 18.6 (paratype ♀).

Head. Ocelli large, projecting above head margin in anterior view; in both sexes median ocellus noticeably smaller than lateral ones (Fig. 2). Antenna with 17 (♂) or 18 (♀) flagellomeres. Width of ocellar triangle: 0.55; width between eyes: 0.43; length of flagellum: 7.3 (♂), 6.9 (♀); length of subterminal (4th) segment of maxillary palp: 0.29; length of terminal segment of maxillary palp: 0.26.

Thorax. Pronotum with 4 long, thick, black setae on anterior margin. Pterothorax with long, thick, black setae on mesoscutellum (2), metascutellum (2), anterodorsal region of mesanepisternum (1), and posterior margin of mesepimeron (1), these setae more prominent in ♂ than in ♀. Legs generally more robust in ♂ than in ♀, with hind legs more noticeably so; hind femur of ♂ very much broader and more spinose than that of ♀, with a dense covering of long, fine setae not present in ♀; hind coxa with 1 or 2 long, thick, black setae, more prominent in ♂ than in ♀; tibial spurs of fore, mid and hind legs of similar size, each pair with lateral spur longer than medial one; comparative lengths of tarsomeres (Fig. 5): see Table 1.



FIGS 1–4. *Bittacus eremus*, paratype female: 1, right wings; 2, head, anterior; 3, 4, apex of abdomen: 3, right lateral, 4, ventral. Abbreviations: c, cercus; S7, 8, 11, sterna 7, 8, 11; T7–11, terga 7–11.

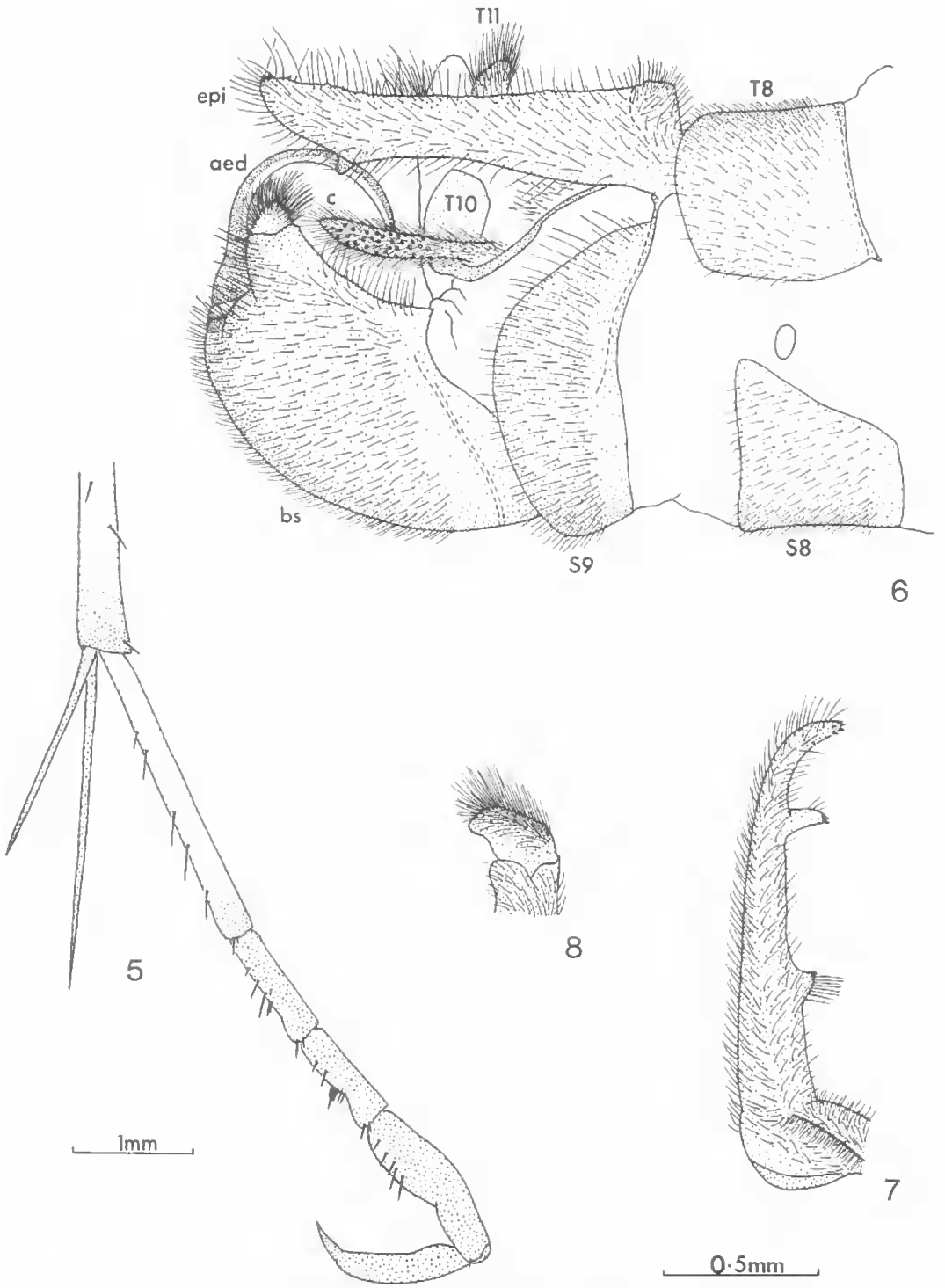
TABLE 1. Tarsomere Length Measurements

Tarsomere		Holotype ♂	Paratype ♀
Fore tarsomere	1	4.4	4.0
	2	1.9	1.7
	3	1.1	1.0
	4	1.0	0.9
	5	0.7	0.6
Mid tarsomere	1	4.0	3.7
	2	1.8	1.6
	3	1.1	1.0
	4	0.9	0.9
	5	0.7	0.6
Hind tarsomere	1	2.5	2.5
	2	1.0	0.9
	3	0.9	0.8
	4	1.4	1.1
	5	1.1	0.7

Wings (Fig. 1): fore wing length: 20.5 (♂), 19.5 (♀); distal costal space without cross-veins; *Sc* joining costal margin distinctly distal to level of first fork of *Rs* (joining further distally in ♂than in ♀); 1 apical subcostal cross-vein at (♀) or just beyond (♂) level of first fork of *Rs* in fore wing, at level of ⅓ to ½ length of basal section of *Rs* (i.e., section between origin and first fork of *Rs*) in hind wing; 2 pterostigmal cross-veins in fore wing, 1 or 2 (♂) or 2 (♀) in hind wing; R_{2+3} divergent from R_{4+5} at an acute angle; apical cross-vein between *CuA* and *CuP* just before (♀) or just after (♂) level of apex of *1A*; *1A* joining hind margin at level of ⅓ to ½ length of basal section of *Rs*, and well before level of first fork of *M*; apical cross-vein between *CuP* and *1A* not present; basal cross-vein between *1A* and *2A* of fore wing about 2/3 length along *2A*.

Abdomen. Lateral margins of anterior terga without long, thick, black setae. Male (Figs 6–8): terga 3–8 with black antecostae. A pair of single-lobed eversible sacs between terga 6–7 and 7–8. Each epiandrial lobe long and prong-like, in lateral view (Fig. 6), in dorsal view (Fig. 7) tapering apically with apex curved mesad; mesal margin with 4 or 6 short spines apically, a hump just before ♀ length with numerous long setae along anterior margin and 2 short apical spines, and a posteroventrally directed prong-like projection at *c.* ¾ length with 2 short apical spines. Fused basistyles in lateral view with ventro-posterior margin evenly curved; dististyle-bearing lobes distinctly dorsally produced (Fig. 6). Dististyle small, with quite long dorsal setae; shape as in Fig. 8. Aedeagus of moderate length, recurved (not coiled), without a terminal filamentous extension. Tergum 10 a simple transverse dorsal plate (not visible in Fig. 6) with each posterior corner narrowly extended posteroventrally and thence curved dorsad around base of cercus to form a large roughly oval area mesal to cercus (Fig. 6); without setae. Cercus *c.* 6 times as long as wide, reaching nearly to dististyle. Tergum 11 small, but well developed and covered with setae; apical margin strongly convex in perpendicular view. Sternum 11 much shorter than tergum 11 and weakly developed, with only lateral and posterior margins sclerotized and setose; truncate, posterior margin in perpendicular view nearly straight with a small median projection. Female (Figs 3, 4): Terga 3–6 and 9 with black antecostae. Sternum 8 transverse, apparently not medially divided; in lateral view (Fig. 3) notched anterodorsally (to accommodate spiracle) and with a large emargination anteriorly; in ventral view (Fig. 4) with anterior margin strongly indented medially and posterior margin broadly convex; strongly pigmented except for anterodorsal corners, a narrow ventromedial strip and a broad ventral posterior marginal area; vestiture: lightly pigmented areas without setae, otherwise clothed with short, fine setae, with numerous longer thicker ones ventrally. Cercus *c.* 4 times as long as wide, reaching just beyond sternum 11. Sternum 11 slightly longer than tergum 11, each truncate with posterior margin nearly straight in perpendicular view. Spermatheca not examined.

Coloration. Head: head capsule yellow-brown with area of ocellar triangle black-brown, area between ocellar triangle and inner eye margin more brownish, clypeus paler, subgena dark brown to black-brown; scape and pedicel yellow-brown; flagellum dark brown; rostrum (of Hepburn 1969), labial palp and apical segments of maxillary palp brown, proximal segments of maxillary palp dark brown. Prothorax: notum cream-brown suffused with dark brown; pleural and cervical sclerites dark brown. Pterothorax: scutella, postnota, katepisterna, epimera and a broad median longitudinal stripe on scuta faintly brownish cream; anepisterna, preepisterna, lateropostnotum and rest of scuta dark brown to black-brown; ventral corners of preepisterna and posteroventral corner of mesepimeron each with a small black mark. Legs: coxae faintly brownish cream to pale



FIGS 5–8. *Bittacus eremus*, holotype male: 5, right hind tarsus and apex of tibia, mesal (setae omitted); 6, apex of abdomen, right lateral; 7 right epiandrial lobe, dorsal; 8, right dististyle, posterior, slightly ventrolateral. Abbreviations: aed, aedeagus; bs, basistyles; c, cercus; epi, epiandrial lobe; S8, 9, sterna 8, 9; T8, 10, 11, terga 8, 10, 11.

brown with anterior face of fore coxa dark brown; mid meron faintly brownish cream dorsally, dark brown ventrally, posterodorsal and ventral corners each with a small black mark; hind meron faintly brownish cream suffused with brown over ventral ♀, posterodorsal margin with an elongate black mark; trochanters cream-brown; femora, tibiae and fore and mid tarsi yellow-brown, with femora paler basally and apices of tibiae black-brown (♂) or dark brown (♀); hind tarsus with apex of segment 1, segments 2–5 and claw dark orange-brown (♂) or orange-brown (♀), rest of segment 1 yellow-brown. Wings: venation brown to dark brown with base of M_4 in each wing and cross-veins near apex of each wing entirely or partly hyaline; a white thyridium at first fork of M in each wing; pterostigmata brown; membrane with a faint brownish tinge and patterned with pale brown to brown as indicated in Fig. 1. Abdomen of ♂: terga 1–5 yellow-brown; tergum 6 brown to dark brown with a broad median area tapering anteriorly and terminating at *c.* 1/6 length yellow-brown; tergum 7 similar to 6, but dark brown shading to black-brown laterally and anteriorly, and with median yellow-brown area a little shorter; tergum 8 black-brown with a large spot on posterior margin yellow-brown; pleura white with some diffuse dull purple blotches; sterna 1–5 gradually shading from very pale yellow-brown (sternum 1) to yellow-brown (sternum 5); sternum 6 brown shading to dark brown posteriorly; sterna 7–9 black-brown; epiandrium pale brown with ventral margins of lobes brown to dark brown; tergum 10 with narrow extensions dark brown to black-brown and oval shaped areas pale brown to brown; basistyles black-brown with dorsal margins pale brown; cercus pale brown to brown; tergum 11, sternum 11 and dististyle pale brown. Abdomen of ♀: terga 1–6, sterna 1–5 and pleura as in ♂; terga 7 and 8 as in ♂, but with lateral and anterior regions brown to dark brown; tergum 9 dark brown with some diffuse pale brown areas on posterior margin; sterna 6 and 7 dark brown, with 6 paler anteriorly; sternum 8 mostly black-brown; tergum 10 pale brown to dark brown; tergum 11, sternum 11 and cercus pale brown.

Notes

B. eremus is the only Australian bittacid with the combination of hind tarsomere 1 considerably longer than tarsomere 4, and *1A* in the hind wing extended beyond the level of the origin of *Rs*.

The specific name is from the Greek adjective *eremos* (lonely) and alludes to the isolation of this species of *Bittacus*. Its nearest congeners live in China, Taiwan and Thailand.

Beauty Spot 98 is a small area (*c.* 40 ha) of rainforest on an upper tributary of Kroombit Creek. The specimens of *B. eremus* were collected on the ridge to the NW of Beauty Spot 98 in tall open eucalypt forest with dominant *Eucalyptus andrewsi* Maiden. Access is by a side road running NE from the main Department of Forestry road across Kroombit Tops at Forestry marker TA54.

DISCUSSION

Justification of the generic assignment of *B. eremus* requires an examination of the history of generic categories in the Bittacidae and hence the present status of the genus *Bittacus*. Until early this century the numerous newly described bittacid species from various parts of the world were all assigned to *Bittacus* Latreille, 1805, the type-species of which is the European *B. italicus* (Müller). Beginning late last century species have been gradually excised from that genus to become the bases of several new genera. Thus in 1885 Gerstaecker extracted two Australian species with hind tarsomere 1 of similar length to hind tarsomere 4 to form *Harpobittacus*; in 1893 McLachlan established *Apterobittacus* for an apterous Californian species; in 1913 Navás established *Pazius* to accommodate a Peruvian species with narrow subpetiolate wings and a very slender abdomen; in 1914 Esben-Petersen assigned a Brazilian species with four or five costal cross-veins and strongly banded wings to *Neobittacus*; in 1974 Byers established *Edriobittacus* to receive an Australian species with, *inter alia*, *1A* very short in the fore wing and almost entirely fused with *CuP* in the hind wing, and in 1979 he separated a long-described North American species with a unique combination of characters as *Hylobittacus*. *Thyridates* Navás, 1908, established to receive an old Chilean species, was long considered a trivial synonym of *Bittacus* until Willmann (1983) resurrected it to accommodate a group of 12 American *Bittacus* species with R_{2+3} diverging from R_{4+5} at 90° in both wings.

The diversity of the family has been further demonstrated this century by the discovery of additional species with 'special' features. These

newly discovered species led to the establishment of the following new genera: *Kalobittacus* Esben-Petersen, 1914, *Nannobittacus* Kimmins, 1927, *Anomalobittacus* Kimmins, 1928, *Anabittacus* Kimmins, 1929, *Austrobittacus* Riek, 1954, *Issikiella* Byers, 1972, *Tytthobittacus* Smithers, 1973, *Orobittacus* Villegas and Byers, 1981, and *Symbittacus* Byers, 1986. The major distinguishing features of these genera, except *Anomalobittacus*, are summarised in the keys presented by Villegas and Byers (1981) and Byers (1986). These keys also include *Edriobittacus* and *Hylobittacus*, and as well, augment the major distinguishing features of *Harpobittacus*, *Apterobittacus*, *Pazius* and *Neobittacus*. *Anomalobittacus* is unique in being brachypterous (see Byers, 1971). As well as the above new genera, a large number of additional *B. italicus*-like species have been newly described this century, especially from Africa and Asia, and assigned to the old genus *Bittacus*.

Bittacus, the oldest genus of the family, has thus come to be a repository for the very many 'non-outstanding' species of the family, basically similar to the genotype *B. italicus*, with the following set of characters: eyes of moderate size, not converging or touching below antennal bases; antennae less than half as long as body; hind tarsomere 1 considerably longer than tarsomere 4; wings fully developed, not extensively colour banded or conspicuously narrowed basally; distal costal space without cross-veins or with only one; R_{2+3} diverging from R_{4+5} at an acute angle in both wings; one or two pterostigmal cross-veins; *1A* long and well developed, in fore wing extending far beyond level of origin of *M*, in hind wing extending well beyond level of origin of *Rs*; male with tergum 9 and sternum 9 not fused into a continous ring, tergum 9 developed as paired epiandrial lobes, dististyles nearly always small and simple, cerci short, not extending beyond tergum 9. *B. eremus* is such a species and therefore must be included in *Bittacus*. It can be distinguished from other species of the genus by the combination of strongly patterned wings and slender, prong-like epiandrial lobes. Eastern Asian species with similarly patterned wings (e.g. *B. maculatus* Issiki, *B. striatus* Issiki) have much boarder and quite differently shaped epiandrial lobes (Issiki, 1927; Cheng, 1957).

The determination of whether or not *Bittacus* is a monophyletic (*sensu* Hennig) category must await a thorough cladistic analysis of the species of the family. Its taxonomic history as well as its very wide distribution, which now includes Australia, suggest that it may be paraphyletic. Until such an analysis, however, further discussion of its distribution, including the presence of an isolated species in Australia, is both premature and pointless.

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